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Commentary: Technology Converges, Power Diffuses

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Advances in additive manufacturing, artificial intelligence and composite materials; improved energy densities in gel fuels; new energy-reflecting coatings; and nanoexplosives mean there are powerful, autonomous, stealthy drones in our immediate future.

Today, commercial firms are creating drones that use a variety of sensors to autonomously execute tasks ranging from aerial spraying to ocean surveillance to air freight. With minor modifications, these drones can become improvised explosive devices (IEDs) that hunt autonomously. And as commercial systems, they are available to almost anyone.

While small numbers of these intelligent, mobile IEDs would be a major problem for US forces, recent advances in these technologies indicate we could face tens of thousands of such drones on the battlefield. Currently, researchers have demonstrated the ability to produce a drone from a 3D-printer in a single day. Other researchers have developed prototype systems that print 25-100 times faster than current models. A single small facility with only 10 such printers will soon be able to produce 1,000 a day.

The advent of large numbers of such autonomous, precision weapons on the battlefield will have four major impacts on the United States.

First will be the loss of immunity to attack from small states and non-state groups. Very long-range drone aircraft and submersibles will provide even small states the capability to strike air and sea ports of debarkation — and perhaps even embarkation. This will create major political problems in sustaining a US military campaign both domestically and internationally. Domestically, will the US public support distant actions if they result in a significant threat to the nation?

Internationally, opponents will have an increased ability to threaten intermediate bases. Suppose ISIS demonstrates to Kuwait that it can hit an airliner sitting at Kuwait International Airport? ISIS states it will not do so as long as Kuwait withdraws landing rights for those nations supporting the Iraqi government.

Is the US prepared to provide the level of defense required to protect key targets across those nations providing interim bases and facilities in the Middle East and Europe? Would those nations allow it to try?

Of more immediate concern will be the far greater number of weapons that can hit large, in-theater logistics facilities such as Bagram, Afghanistan, or Taji, Iraq. Could we keep Bagram open against a threat like this? And would the benefits of doing so outweigh the costs?

Second, these systems may make defense tactically dominant. A tactical shift from offense to defense dominance may create a situation similar to what existed between 1863 and 1917, where any person who was in range and moving above the surface of the ground could be cheaply targeted and killed. The result was static trench warfare.

Drone swarms may make defense tactically dominant in ground, air, and sea warfare. The Department of Defense needs to run rigorous experiments to understand the character of such a conflict. Currently, DoD is testing various approaches to deal with the exponential increase in targets.

It is imperative that these systems be tested against a thinking, reacting opposition that employs creative but practical countermeasures. If the experiments show defense to be tactically dominant, DoD will have to work out how US forces can still achieve their inherently offensive operational and strategic missions.

Third, technological convergence is pointing to the revival of mass (in terms of numbers) as a key combat multiplier. Additive manufacturing may make large numbers of cheap drones available to all states and many non-state actors. How will our forces, which are dependent on a few, exquisite platforms — particularly air and sea — deal with the small, smart and many?

Fourth, after the fall of the Soviet Union, the United States abandoned the concept of mobilization. Mobilization in World War II was possible because industry could rapidly convert from civilian to military production. By 1990, the complexity of modern military weapons systems, and the manufacturing plants and skills needed to produce them, made such a rapid conversion difficult, if not impossible.

In contrast, additive manufacturing is inherently flexible, since the product produced depends only on the materials the machine can use and the software that is loaded. Thus, as additive manufacturing assumes a greater role in industry, the possibility of industrial mobilization will re-emerge. Can the Pentagon manage such a mobilization? Success will require significant peacetime planning.

In summary, this new diffusion of power has major implications for the conduct of warfare and national strategy. The proliferation of many small and smart weapons may simply overwhelm our exceptionally capable, but relatively few, weapons systems. The advances may force the United States to rethink its procurement plans, force structure and force posture.

The diffusion of power will also greatly complicate US responses to various crises, reduce its ability to influence events with military force, and should require policymakers and military planners to thoughtfully consider future policies and strategy.

T.X. Hammes served 30 years in the US Marine Corps and is currently a distinguished research fellow at the US National Defense University. This commentary is adapted from the Cato Institute Policy Analysis no. 786, "Technologies Converge and Power Diffuses: The Evolution of Small, Smart, and Cheap Weapons," January 27, 2016. The views expressed are his own and do

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